X->mumu

HyperCP experiment at Fermilab (data from 1999) reported in 2005 evidence for $\mathcal{B}(\Sigma^+ \to p\mu^+\mu^-) = [8.6^{+6.6}_{-5.4}(\text{stat})\pm 5.5(\text{syst})]\times 10^{-8}$.

See this nice Moriond summary:
http://arxiv.org/abs/hep-ex/0606038v1

SM BR expected to be between 1.6 – 9 x 10^{-8}, so could just be SM.
But strange $M_{\mu\mu}$ distribution!

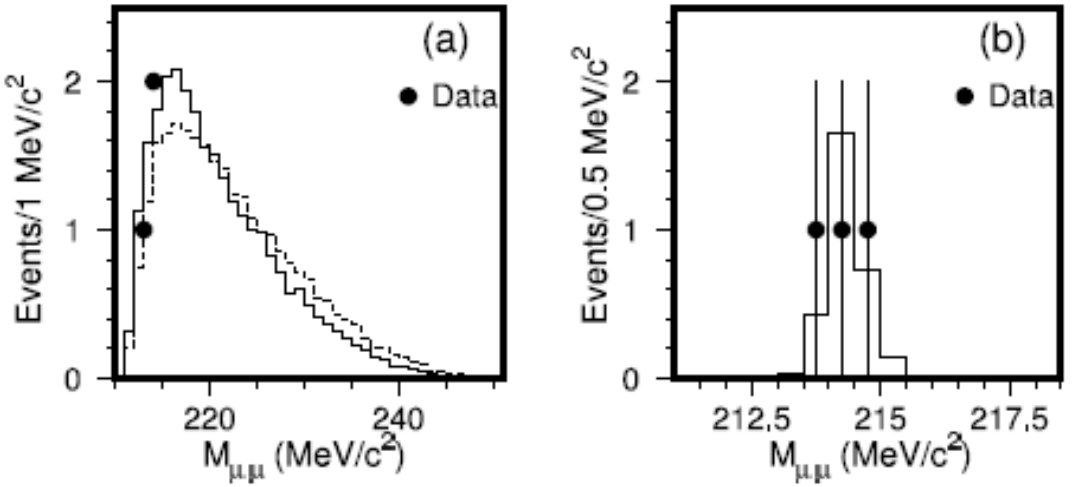


Figure 4: The $\mu^+\mu^-$ invariant mass of the three signal events with superimposed (a) Monte Carlo form factor decays (solid histogram) and uniform phase-space decays (dashed histogram), and (b) Monte Carlo $\Sigma^+ \to pX^0$, $X^0 \to \mu^+\mu^-$ events generated with $m_{X^0} = 214.3\text{MeV}/c^2$.

H->aa->mumu

Consistent with the “a”, pseudo-scalar Higgs in NMSSM model

If “a” is $<2m_{tau}$ it could decay to mumu primarily

Higgs could have large BR to aa

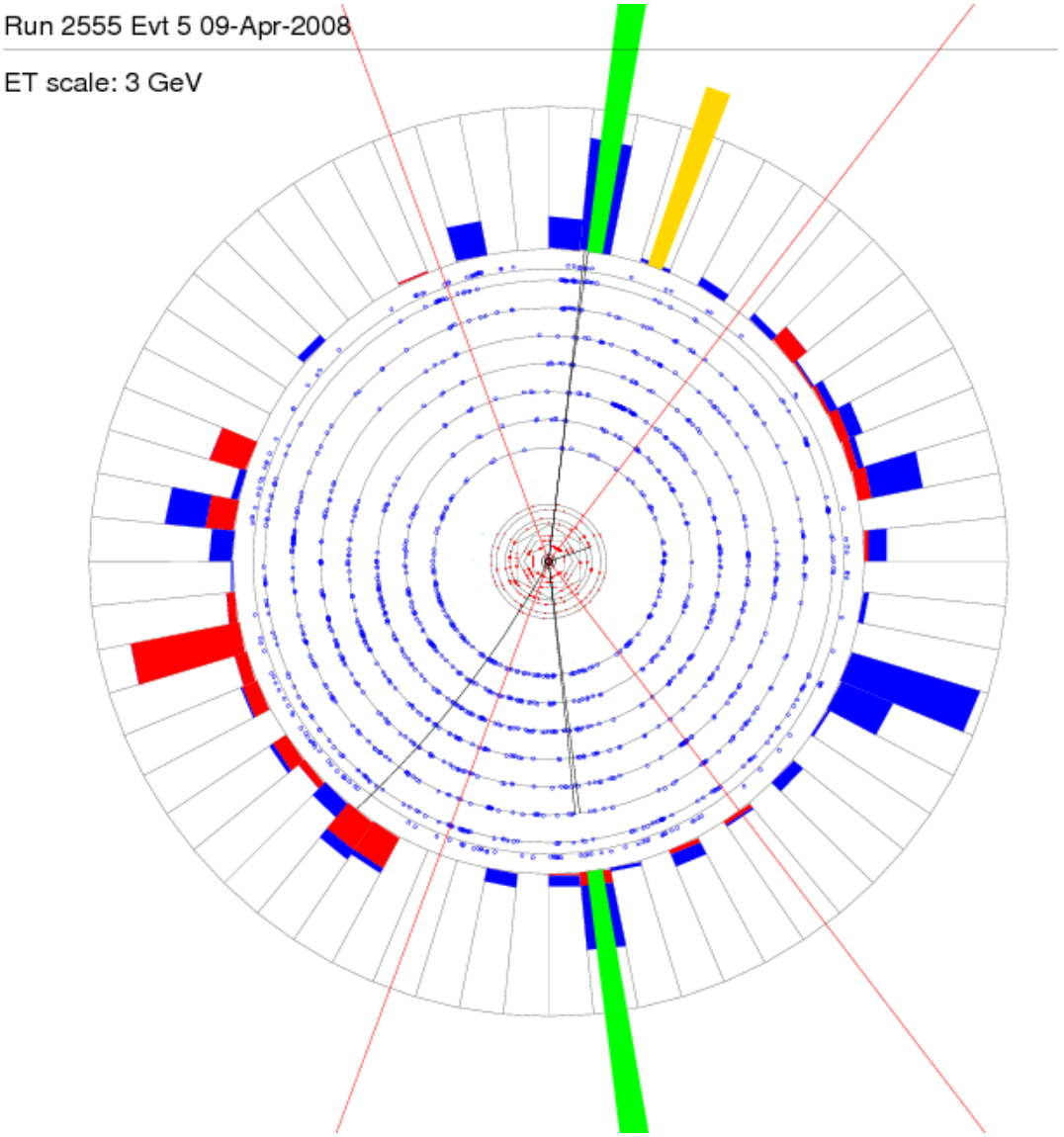
Should search for H->aa->mumu decays?

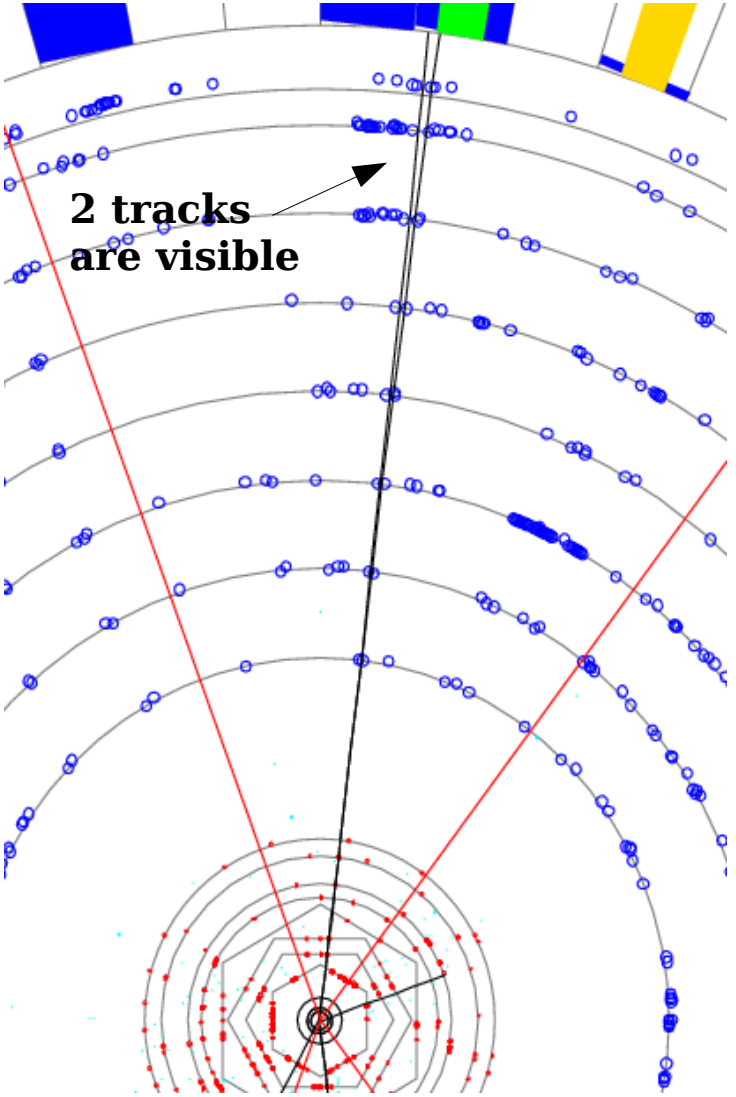
Jay Wacker (stopped gluino guy at Stanford) has looked into the phenomenology for me

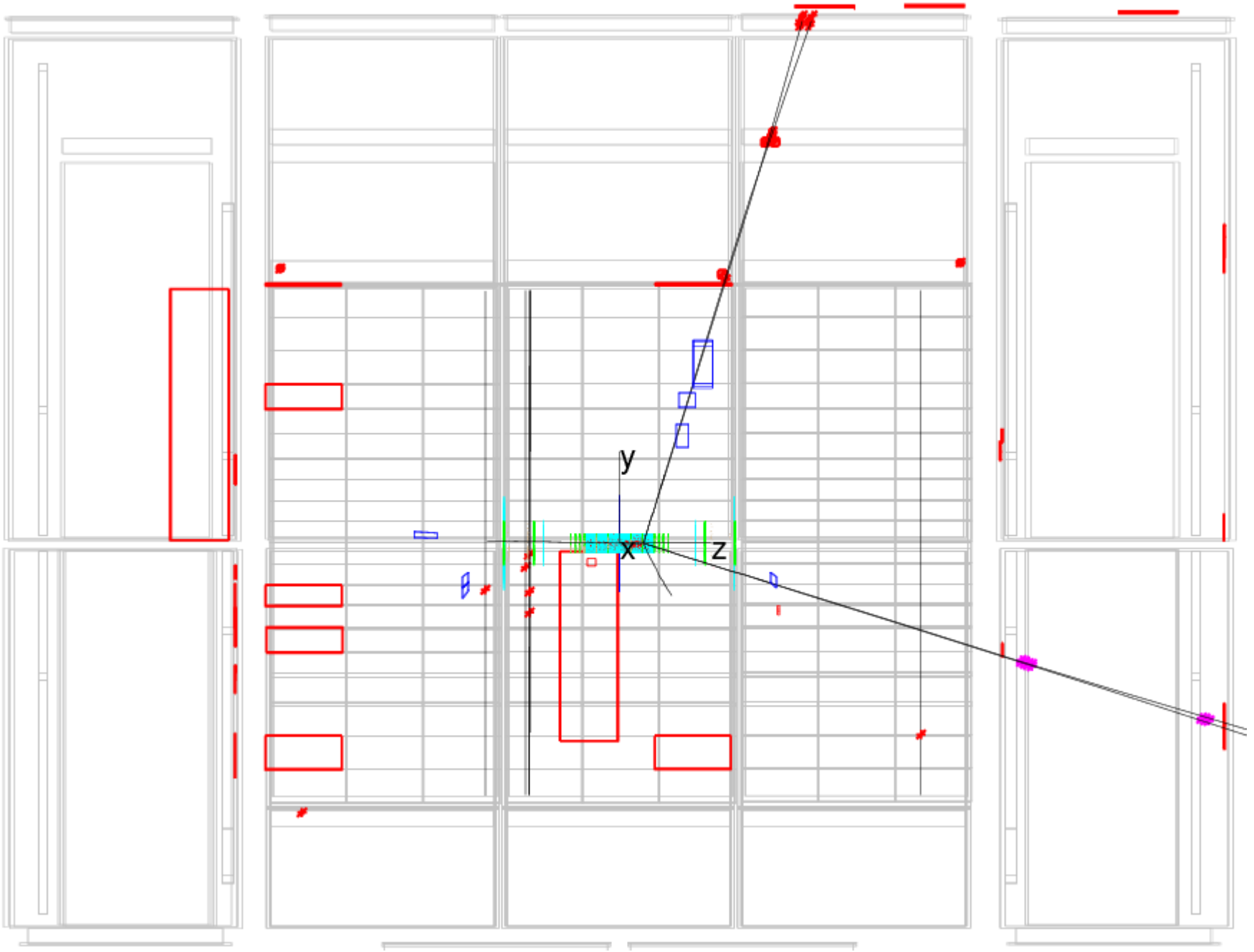
- In fact he just wrote today to show me that it has been studied recently! http://arxiv.org/abs/hep-ph/0611270v3

H->aa->mumu

If M_a is just above $2M_{mu}$ the muons will be extremely collinear !!!






y
x
z

H->aa->mumu

A very distinct signature

Would have been overlooked since
- only one “muon” is reconstructed per collinear muon pair
- muon fails standard “track isolation” (I think)

Analysis would have to specifically look for muons which had a collinear partner track (and still good calorimeter isolation)

Two pairs in the same event would be a smoking gun